Claims

1. A process of preparing an aqueous composition comprising a polysilicate, wherein the composition is a substantially uniform liquid when measured at 25°C, comprising the steps of,

i) providing an aqueous liquid having a source of silicate,

ii) adjusting the pH of the liquid to between about 2 and about 10.5, thereby causing polymerization of the silicate,

iii) allowing sufficient time for the polymerization to proceed to substantial completion and thereby forming a product comprising gelled material,

and

iv) subjecting the gelled material to sufficient shear to form a substantially uniform liquid.

2. A process according to claim 1 in which the source of silicate is selected from the group consisting of sodium silicate, potassium silicate and lithium silicate.

3. A process according to claim 1 in which the aqueous liquid in step (i) also comprises aluminum compounds.

4. A process according to claim 1 in which in step (ii) the pH is adjusted to between 4 and 9.

5. A process according to claim 1 in which the liquid is subjected to agitation in step (iii).

6. A process according to claim 1 in which the product formed in step (iii) comprises amorphous gelled solids dispersed in a liquid.

7. An aqueous composition comprising a polysilicate obtained by a process according to claim 1.

8. An aqueous composition according to claim 7 which exhibits a viscosity of at least 200 mPas when measured at 2% by weight concentration at 25°C using a Brookfield viscometer, at 20 rpm, spindle No 2.

9. An aqueous composition according to claim 7 which exhibits a viscosity of at least 1500 mPas when measured at 2% by weight concentration at 25°C using a Brookfield viscometer, at 20 rpm, spindle No 3.

10. An aqueous composition according to claim 7, in which the polysilicate has a surface area of below 2000 m^2/g.

11. An aqueous composition according to claim 7, in which the polysilicate has an S-value of below 5%.

12. An aqueous composition comprising a polysilicate, wherein the composition is a substantially uniform liquid when measured at 25°C and the composition exhibits a viscosity of at least 200 mPas when measured at 2% by weight concentration at 25°C using a Brookfield viscometer, at 20 rpm, spindle No 2, and wherein the polysilicate has a surface area of below 2000 m^2/g and has an S-value of below 5%.

13. An aqueous composition according to claim 12 which exhibits a viscosity of at least 1500 mPas when measured at 2% by weight concentration at 25°C using a Brookfield viscometer, at 20 rpm, spindle No 3.

14. An aqueous composition according to claim 7, in which the polysilicate has a surface area of between 750 and 1250 m^2/g.

15. An aqueous composition according to claim 7, in which the polysilicate is a polyaluminosilicate.

16. An aqueous composition according to claim 7, and in which the concentration of SiO_2 is at least 0.01% by weight.

17. A process of making paper or paperboard comprising forming a cellulosic suspension, draining water from the suspension to form a wet sheet and then drying the sheet, wherein an aqueous composition according to claim 7 is added to the cellulosic suspension.

18. A process according to claim 17, in which mineral filler is mixed into the cellulosic suspension wherein the mineral filler comprises an aqueous composition comprising a polysilicate, wherein the composition is a substantially uniform liquid when measured at 25°C, and wherein the aqueous composition comprising the polysilicate is obtained by the process comprising the steps of,

i) providing an aqueous liquid having a source of silicate,

ii) adjusting the pH of the liquid to between about 2 and about 10.5, thereby causing polymerization of the silicate,

iii) allowing sufficient time for the polymerization to proceed to substantial completion and thereby forming a product comprising gelled material,

and

iv) subjecting the gelled material to sufficient shear to form a substantially uniform liquid.

19. A process according to claim 18, in which the aqueous composition is added to the cellulosic suspension in an amount of from 20 to 250 kg/ton based on dry weight of polysilicate and dry weight of cellulosic suspension.

20. A process according to claim 19, in which at least one further filler is mixed with the cellulosic suspension, in which the further filler is either a mineral filler and/or an organic pigment.

21. A process according to claim 20 in which the further filler is selected from the group consisting of precipitated calcium carbonate (PCC), ground calcium carbonate, clays, calcined clays, talc, zeolites, silicas, titanium dioxide and structured pigments.

22. A process according to claim 20 in which the aqueous composition and the further filler is combined prior to addition to the cellulosic suspension.

23. A process according to claim 20 in which the aqueous composition and the further filler are added separately to the cellulosic suspension.

24. A process according to claim 23 in which the aqueous composition and further filler are added sequentially to the cellulosic suspension.

25. A process according to claim 17, in which a retention and drainage system is applied to the cellulosic suspension.

26. A process according to claim 25, in which the retention and drainage system comprises mixing into the cellulosic suspension a polymeric retention/drainage aid and a micro particulate retention/drainage aid.

27. A process according to claim 26, in which the polymeric retention/drainage aid is selected from the group consisting of substantially water-soluble anionic, non-ionic, cationic and amphoteric polymers.

28. A process according to claim 26, in which the micro particulate retention/drainage aid is selected from the group consisting of cross linked organic polymers, silica microgels, colloidal silica, silica sols, silica gels, polysilicates, aluminosilicates, polyaluminosilicates, borosilicates, polyborosilicates, zeolites and swellable clay.

29. A process according to claim 25, in which the retention and drainage system is applied to the cellulosic suspension subsequent to the addition of the mineral filler.

30. A process of making paper or paperboard comprising forming a cellulosic suspension, applying a retention and drainage system to the suspension, draining water from the suspension to form a sheet and then drying the sheet, wherein the retention and drainage system comprises mixing into the cellulosic suspension an aqueous composition according to claim 7.

31. A process according to claim 30, in which the aqueous composition is mixed into the cellulosic suspension in an amount of at least 100 g/ton, based on weight of silica on dry weight of cellulosic suspension.

32. A process according to claim 30, in which the retention and drainage system further comprises mixing into the cellulosic suspension a polymeric retention/drainage aid and/or a micro particulate retention/drainage aid.

33. A process according to claim 32, in which polymeric retention/drainage aid is selected from the group consisting of substantially water-soluble anionic, non-ionic, cationic and amphoteric polymers.

34. A process according to claim 32, in which the micro particulate retention/drainage aid in selected from the group consisting of cross linked organic polymers, silica microgels, colloidal silica, silica sols, silica gels, polysilicates, aluminosilicates, polyaluminosilicates, borosilicates, polyborosilicates, zeolites or swellable clay.

35. A process according to claim 30, in which a polymeric retention/drainage aid is mixed into the cellulosic suspension before at least one shear stage selected from the group consisting of mixing, cleaning and pumping stages and then adding to the cellulosic suspension after the at least one shear stage, a retention/drainage aid comprising the aqueous composition.

36. A process according to claim 35 in which a micro particulate retention/drainage aid is also added to the cellulosic suspension after the at least one shear stage.

37. A process of making paper or paperboard comprising forming a cellulosic suspension, mixing mineral filler into the cellulosic suspension, applying a retention and drainage system to the suspension, draining water from the suspension to form a wet sheet and drying the sheet, wherein the mineral filler comprises an aqueous composition according to claim 7, the suspension is passed through at least one shear stage before applying the retention and drainage system, and in which the applying of the retention and drainage system comprises introducing into the cellulosic suspension an aqueous composition according to claim 7 and in which the shear stages are selected from mixing, cleaning and pumping stages.

38. A process according to claim 37, in which at least one further filler is mixed with the cellulosic suspension, in which the further filler is either a mineral filler and/or an organic pigment.

39. A process according to claim 38 in which the further filler is selected from the group consisting of precipitated calcium carbonate (PCC), ground calcium carbonate, clays, calcined clays, talc, zeolites, silicas, titanium dioxide and structured pigments.

40. A process according to claim 38 in which the aqueous composition and the further filler is combined prior to addition to the cellulosic suspension.

41. A process according to claim 38 in which the aqueous composition and the further filler are added separately to the cellulosic suspension.

42. A process according to claim 41 in which the aqueous composition and further filler are added sequentially to the cellulosic suspension.

43. A process according to claim 37, in which the mineral filler is precipitated calcium carbonate and is added to the cellulosic suspension and the suspension is passed through at least one shear stage and then an aqueous composition is mixed into the cellulosic suspension, wherein the aqueous composition comprises a polysilicate, wherein the composition is a substantially uniform liquid when measured at 25°C, wherein the aqueous composition comprising the polysilicate is obtained by a process comprising the steps of,

i) providing an aqueous liquid having a source of silicate,

ii) adjusting the pH of the liquid to between about 2 and about 10.5, thereby causing polymerization of the silicate,

iii) allowing sufficient time for the polymerization to proceed to substantial completion and thereby forming a product comprising gelled material,

and

iv) subjecting the gelled material to sufficient shear to form a substantially uniform liquid.

44. A process according to claim 37, in which subsequent to the addition of mineral filler comprising an aqueous composition comprising a polysilicate, the cellulosic suspension is passed through at least one shear stage followed by the addition of a polymeric retention/drainage aid and then the cellulosic suspension is passed through at least one further shear stage after which a retention/drainage aid comprising an aqueous composition comprising a polysilicate is added to the cellulosic suspension, wherein the aqueous compositions comprising a polysilicate are substantially uniform liquids when measured at 25°C,wherein the aqueous compositions comprising the polysilicate is obtained by a process comprising the steps of,

i) providing an aqueous liquid having a source of silicate,

ii) adjusting the pH of the liquid to between about 2 and about 10.5, thereby causing polymerization of the silicate,

iii) allowing sufficient time for the polymerization to proceed to substantial completion and thereby forming a product comprising gelled material,

and

iv) subjecting the gelled material to sufficient shear to form a substantially uniform liquid.

45. A process according to claim 44 in which a further micro particulate retention/drainage aid is added to the cellulosic suspension prior to, simultaneously with or after the addition of the retention/drainage aid comprising the aqueous composition.

46. A process of making paper or paperboard comprising forming a cellulosic suspension, adding a strength aid to the cellulosic suspension, draining water from the suspension to form a wet sheet and drying the sheet, wherien the strength aid comprises an aqueous composition according to claim 7.

47. A process of making paper or paperboard comprising forming a cellulosic suspension, draining water from the suspension to form a wet sheet and then drying the sheet, wherein an aqueous composition comprising a polysilicate is added to the cellulosic suspension, in which the aqueous composition is formed by a process which process comprises the steps of,

i) providing an aqueous liquid having a source of silicate,

ii) adjusting the pH of the liquid to between about 2 and about 10.5, thereby causing polymerization of the silicate,

and

iii) allowing sufficient time for the polymerization to proceed to substantial completion and thereby forming a product comprising gelled material,

wherein the product of step (iii) is sheared before addition to the cellulosic suspension.